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## BASIC LEVEL FULL SYLLABUS TEST -1 (GATE 2023) - REPORTS

OVERALL ANALYSIS    COMPARISON REPORT    **SOLUTION REPORT**

ALL(65)    CORRECT(44)    INCORRECT(14)    SKIPPED(7)

Q. 31

Have any Doubt ?



If  $(xy)_{15} = (40)_y$ , then which of the following solutions  $(x, y)$  satisfy the given equation?

A (4, 20)

B (1, 5)

Your option is Correct

C (2, 10)

Your option is Correct

D (3, 15)

YOUR ANSWER - b,c

CORRECT ANSWER - b,c

STATUS -

**Solution :**

(b, c)

$$(xy)_{15} = (40)_y$$

$$\Rightarrow 15x + y = 4y$$

$$\text{or, } 5x = y$$

Subject to constraints  $5 \leq y < 15$   
and  $x < 15; x \geq 0, y > 0$

Only 2 solutions i.e. (1, 5) and (2, 10) satisfy the above equation.  
 $\therefore$  (b) and (c) are correct.

QUESTION ANALYTICS

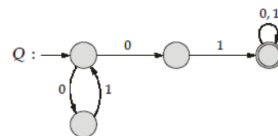
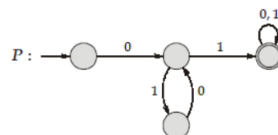


Q. 32

Have any Doubt ?



Consider the following NFAs,  $P$  and  $Q$  over the alphabet  $\{0, 1\}$ .



If  $L(P)$  and  $L(Q)$  denotes the languages accepted by the NFAs  $P$  and  $Q$ , which of the following choices is false?

A  $L(P) = L(Q)$

B  $L(P) \subseteq L(Q)$

C  $L(P) \supseteq L(Q)$

D None of these

Your answer is Correct

**Solution :**

(d)

Clearly both  $P$  and  $Q$  accept the same language. Why? Take a look at their regular expressions.

$$L(P) = 0(10)^*1(0+1)^*$$

$$L(Q) = (01)^*01(0+1)^*$$

We need to show that both are equal. We'll start with  $L(P)$  and show that it is equal to  $L(Q)$ .

So we have

$$L(P) = 0(10)^*1(0+1)^*$$

Using

$$p(qp)^* = (pq)^*p, \text{ we get,}$$

$$L(P) = (01)^*01(0+1)^*, \text{ which is clearly } L(Q).$$

Since,

$$L(P) = L(Q), \text{ it implies (a), (b) and (c) are all true for the above NFAs.}$$

Hence (d) is the most appropriate choice.



QUESTION ANALYTICS



Q. 33

Have any Doubt ?



Which of the following statement(s) are true?

A

For user level threads, a blocking system call blocks the entire process.

Your option is Correct

B

For Kernel level threads, a blocking system call blocks the entire process.

C

User level threads are transparent to the Kernel.

Your option is Correct

D

Every thread in the system has its own stack.

Your option is Correct

YOUR ANSWER - a,c,d

CORRECT ANSWER - a,c,d

STATUS - ✓

Solution :

(a, c, d)

Since user level threads are transparent to the Kernel, a blocking system call blocks the entire process, and hence (a) and (c) are true. But Kernel level threads are not transparent to the Kernel, hence (b) is false. Also, every thread has to have its own stack, and its own set of registers, and these can't be shared between any two threads. So (d) is also true. Therefore the final key for this question is (a), (c) and (d).



QUESTION ANALYTICS



Q. 34

Have any Doubt ?

Consider the relation  $R(A_1, A_2, A_3, \dots, A_n)$  where candidate keys are  $A_1A_2$  and  $A_3A_4$  respectively for some  $n$ . If  $R$  has 56 super keys, then the value of  $n$  will be

A

3

B

5

C

7

Your answer is Correct

Solution :

(c)

$$\begin{aligned}\text{Number of super keys } (R) &= n(\text{Superkeys containing } A_1A_2) + n(\text{Superkeys containing } A_3A_4) \\ &\quad - n(\text{Superkeys containing } A_1A_2A_3A_4) \\ &= (2^n - 2 + 2^n - 2 - 2^{n-4}) = (7 \times 2^{n-4})\end{aligned}$$

$$\begin{aligned}\text{Given, } (7 \times 2^{n-4}) &= 56 \Rightarrow 2^{n-4} = 8 \\ \therefore n &= 7\end{aligned}$$

D

None of these



QUESTION ANALYTICS



Q. 35

Have any Doubt ?

Let  $A$  and  $B$  be two matrices, and  $k$  be a non zero positive integer. If the ranks of  $A$  and  $B$  are  $2^k$  and  $3^k$  respectively, then the rank of the product matrix  $AB$  will be

A

 $6^k$ 

B

 $3^k$ 

C

 $2^{2k}$ 

D

 $2^k$ 

Your answer is Correct

Solution :

(d)

$$\text{Since, } \text{rank}(AB) = \min(\text{rank}(A), \text{rank}(B))$$

Therefore,  $\min(2^k, 3^k) = 2^k$  for  $k > 0$ ;  
Hence,  $\text{rank}(AB) = 2^k$  which means that (d) is the correct answer



QUESTION ANALYTICS



Q. 36

Have any Doubt ?



A bit-stuffing based framing protocol uses an 8-bit delimiter pattern of 01111110. If the output bit-string after stuffing is 01111100101, then the input bit-string is

☐ A 0111110100

☒ B 0111110101

Your answer is Correct

Solution :

(b)

The rule at the sender is - after seeing five 1's, stuff a 0. So in the given pattern, the 7<sup>th</sup> bit from the left is a 0, which is encountered after seeing five 1's, so the receiver must remove it. Therefore we end up with 0111110101 which happens to be choice (b).

☐ C 0111111101

☐ D 0111111111



QUESTION ANALYTICS



Q. 37

Have any Doubt ?



Which of the following design characteristics are used by RISC processors?

☒ A Register-to-register arithmetic operations only

Your option is Correct

☐ B Hardwired control unit

Your option is Correct

☐ C Microprogrammed control unit

☒ D Fixed length instruction format

Your option is Correct

YOUR ANSWER - a,b,d

CORRECT ANSWER - a,b,d

STATUS -

Solution :

(a, b, d)

RISC processors use hardwired CU, and not Microprogrammed CU.  
Hence (c) is false. All other options are true.



QUESTION ANALYTICS



Q. 38

Have any Doubt ?



Let S be a binary search tree with 127 nodes. Let  $x$  and  $y$  denote the maximum and minimum possible height of S. Then the value of  $x$  and  $y$  will be

☐ A 127, 7

☐ B 127, 6

☒ C 126, 6

Your answer is Correct

Solution :

(c)

Height will be maximum if the tree is either left skewed or right skewed.

So,  $\text{maximum height} = x$   
 $= 127 - 1 = 126$

Height will be minimum if S is a complete binary tree.

So,  $\text{minimum height} = y = \log(127 + 1) - 1$   
 $= \log(128) - 1 = 6$

Hence option (c) will be the answer.

**D** 128, 8



QUESTION ANALYTICS



Q. 39

Have any Doubt ?



The minimum number of comparisons required in order to find the maximum and minimum of 64 numbers is equal to \_\_\_\_\_.

**C** 94

Your answer is **Correct**94

Solution :

94

$$\left(\frac{3n}{2}\right) - 2 = \frac{3(64)}{2} - 2 = 94$$



QUESTION ANALYTICS



Q. 40

See your Answers



Let X and Y be two events such that  $P\left(\frac{X}{Y}\right) = \frac{1}{2}$ ,  $P\left(\frac{Y}{X}\right) = \frac{1}{3}$  and  $P(X \cap Y) = \frac{1}{6}$ .

Which of the following is true?

**A**  $P(X \cup Y) = \frac{2}{3}$

Your option is **Correct**

**B** X and Y are independent

Your option is **Correct**

**C** X and Y are not independent

**D**  $P(X \cap \bar{Y}) = \frac{5}{6}$

Correct Option

YOUR ANSWER - a,b

CORRECT ANSWER - a,b,d

STATUS -

Solution :

(a, b, d)

$$P(X \cap Y) = P(Y)P\left(\frac{X}{Y}\right)$$

$$\frac{1}{6} = \left(\frac{1}{2}\right) \times P(Y) \Rightarrow P(Y) = \frac{1}{3}$$

$$\text{Similarly, } P(X \cap Y) = P(X)P\left(\frac{Y}{X}\right)$$

$$\text{Put values to get } P(X) = \frac{1}{2}$$

Therefore we can see that

$$\frac{P(X \cap Y)}{\frac{1}{6}} = \frac{P(X)}{\frac{1}{2}} \times \frac{P(Y)}{\frac{1}{3}}$$

Hence X and Y are independent.

Therefore (b) is correct  $\Leftrightarrow$  (c) is incorrect.

Checking (a):

$$\begin{aligned} P(X \cup Y) &= P(X) + P(Y) - P(X \cap Y) \\ &= \left(\frac{1}{2} + \frac{1}{3}\right) - \frac{1}{6} = \frac{5}{6} - \frac{1}{6} = \frac{2}{3} \end{aligned}$$

$\therefore$  (a) is also correct.

Check (d):

$$\begin{aligned} P(X \cup \bar{Y}) &= P(X) + P(\bar{Y}) - P(X \cap \bar{Y}) \\ &= \frac{1}{2} + \left(1 - \frac{1}{3}\right) - \left[\left(\frac{1}{2}\right)\left(1 - \frac{1}{3}\right)\right] \quad \{\text{Since } P(\bar{Y}) = 1 - P(Y)\} \\ &= \frac{1}{2} + \frac{2}{3} - \left(\frac{1}{2}\right)\left(\frac{2}{3}\right) \\ &= \frac{1}{2} + \frac{2}{3} - \frac{1}{3} = \left(\frac{1}{2} + \frac{1}{3}\right) = \frac{5}{6} \end{aligned}$$

Option (a) is correct.  
Therefore (a), (b) and (d) are correct.



QUESTION ANALYTICS

